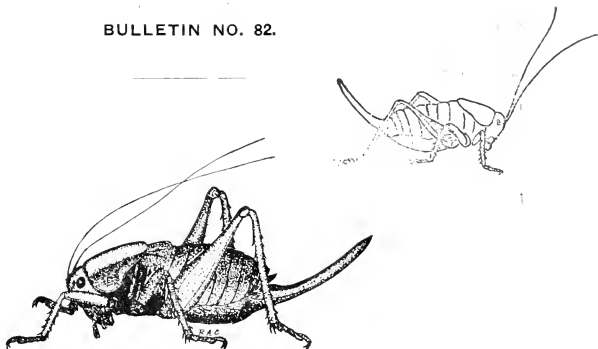


S
353.9
E3R
1910 NO. 8
1

MONTANA AGRICULTURAL COLLEGE
EXPERIMENT STATION

F. B. LINFIELD, Director.

BULLETIN NO. 82.



EIGHTH ANNUAL REPORT
OF THE
State Entomologist of Montana

By
R. A. COOLEY

DECEMBER, 1910
Bozeman, Mont.

MONTANA AGRICULTURAL COLLEGE EXPERIMENT STATION.

BOZEMAN, MONTANA.

STATE BOARD OF EDUCATION

EDWIN L. NORRIS, <i>Governor</i>	} <i>Ex-Officio</i>	
A. J. GALEN, <i>Attorney General</i>		Helena
W. E. HARMON, <i>Sup't Public Instruction</i>		
S. D. LARGENT		Great Falls
C. H. HALL		Missoula
ROY C. AYRES		Lewistown
O. P. CHISHOLM		Bozeman
O. W. McCONNELL		Helena
H. G. PICKETT		Helena
G. T. PAUL		Dillon
N. R. LEONARD		Butte

EXECUTIVE BOARD

JAMES M. HAMILTON, <i>President</i>		Bozeman
J. H. BAKER, <i>Vice-President</i>		Bozeman
WALTER S. HARTMAN,		Bozeman
GEO. COX, <i>Secretary and Treasurer</i>		Bozeman

STATION STAFF

F. B. LINFIELD, B. S. A., <i>Director</i> .
R. A. COOLEY, B. Sc., <i>Entomologist</i>
ALFRED ATKINSON, B. S. A., <i>Agronomist</i>
ROBERT W. CLARK, B. S. A., <i>Animal Industry</i> .
EDMUND BURKE, B. S., <i>Chemist</i>
DEANE B. SWINGLE, M. S., <i>Botanist and Bacteriologist</i> .
O. B. WHIPPLE, B. S., <i>Horticulturist</i> .
W. J. TAYLOR, D. V. M., <i>Veterinarian</i>
J. B. NELSON, <i>Superintendent Dry Farm Work</i> .
REUBEN M. PINCKNEY, B. S., A. M., <i>Assistant Chemist</i> .
L. F. GIESEKER, B. S., <i>Assistant Agronomist</i> .
WM. F. SCHOPPE, B. S., <i>Assistant Poultryman</i> .
H. E. MORRIS, B. S., <i>Assistant Botanist</i> .
R. C. JONES, B. S., <i>Assistant Dairyman</i> .
J. R. PARKER, B. A., <i>Assistant Entomologist</i> .
LYMAN G. SCHIRMERHORN, B. S., <i>Assist. Horticulturist</i> .
R. F. MILLER, B. S. A., <i>Assistant Animal Industry</i> .
A. J. CARROLL, <i>Clerk</i> .

NOTICE—The Bulletins of the Experiment Station will be mailed free to any citizen of Montana on request. Please state whether all the publications are desired as issued or only those specified. Give name and address plainly.

All communications to the Experiment Station should be addressed to
THE MONTANA EXPERIMENT STATION.

Bozeman, Montana.



The Eighth Annual Report of the State Entomologist of Montana

Considering the stage of her development, Montana has her full share of the pests and diseases affecting plant life and there is no crop of importance grown in the State that is not more or less seriously affected.

Entomologists, after carefully looking into the matter, have concluded that, on an average, fully ten per cent of the total produce of the country is annually destroyed by insect pests. The detailed estimates have been submitted to the scientific world and have gone unquestioned. The recently issued annual report of the Secretary of Agriculture places the value of the total agricultural produce of the United States during the year 1910 at the enormous figure of \$8, 926,000,000.00, a sum quite beyond comprehension. Ten per cent of this is \$892,000,000.00, or the approximate sum that our country loses annually from the depredations of insect pests. Montana's share of this loss is about in proportion to her contribution to the total crop of the country, and, were the exact figures now available, it could be shown that our various classes of farmers would be benefited by hundreds of thousands, or even millions, of dollars, were insects and diseases of crops brought fully under control.

MONTANA NOT FREE FROM PESTS AS OFTEN REPORTED.

There is a widespread impression in Montana that, while other parts of the country are seriously affected with pests, our fair land is nearly or quite free. We have shown, in earlier reports and bulletins, that there is already a large proportion of the pests and diseases that could reasonably be expected to thrive in our climate and that, in number and power of doing injury, there is really little difference between the pests of our State and those of other States.

This erroneous idea may be attributed to two things, namely, the false impression given out by interested property owners,

and a general lack of knowledge of the facts of the case. We have been repeatedly called upon to give information to persons who were thinking of buying property in Montana and had been led to believe that climatic and other conditions were such that, while fruits reach a high stage of perfection, their pests are unable to live here.

It is not the aim of the State Entomologist to interfere with the development of our agricultural industries by needlessly advertising the pests that are to be found here or that are expected to appear, but it is our purpose to discover the facts and make them known through the regular publicity channels of the Montana Agricultural College.

FARMERS AND FRUIT GROWERS NEED MORE INFORMATION.

It is clearly our duty, also, to gather and distribute as rapidly as possible the information needed by our farmers and fruit growers for the control of the pests of their various crops. It is a remarkable fact that, in very many cases, it is not only necessary to devise and make known effective remedies for each pest, but also to apprise the farmer of the fact that the insect or disease is working in his crop and doing damage. Our observations in the State have brought out strikingly the fact that the farmer, as a rule, does not notice that an injury is being done to his crops until it becomes very serious. A recent experience illustrates this. Knowing that the army cutworm was causing serious losses in some parts of the State, the writer took occasion to inquire of a farmer if the worms were injuring a certain large field that he owned. He replied that he had recently been through the field but had been unable to find any of the worms. The writer was passing the place the same day and went in to look for the pest. In a general way the crop appeared well and only in spots was an injury from cutworms apparent, yet the worms were very abundant, though not amounting to an "army". It was estimated that there were at least two worms to every square foot in the field, or 87,432 worms per acre. In other words they were abundant enough to do real damage to the crop, and doubtless the yield was distinctly reduced. In many instances we have had similar experiences with various kinds of crops.

There is a growing interest in these subjects, and many farmers and fruit growers are anxious for information.

A MOVABLE EXHIBIT NEEDED.

Considerable attention has recently been given to devising a plan by which farmers may easily inform themselves concerning the important pests of their crops and the remedies to be used, and it has been decided that it is very desirable to prepare an extensive exhibit, which can be moved from place to place about the State and which will be largely self-explanatory. The exhibit will consist of three parts, namely:

1. A series of small, glass-covered boxes, each containing a specimen of one insect or disease and showing the various stages or conditions through which it passes and its effect on plants. These boxes can be taken in the hands and examined closely.

2. A series of charts showing and explaining the same insects and diseases, and numbered to correspond with the boxes. These charts are necessary in order that the life histories may be understood, and will involve the preparation of diagrams to assist in understanding the more or less intricate life histories.

3. A pamphlet issued in the regular Experiment Station series of circulars, giving figures made from photographs of the diagrams or boxes and accompanied by explanations and short, easily understood statements regarding preventive measures and remedies. This circular will be issued in sufficient numbers to supply each visitor to the exhibit with a copy, which may be taken home and made use of in fighting the pests and diseases.

It is intended that this exhibit shall be shown at county fairs, the state fair, on special agricultural trains, and that it shall be placed in the chamber of commerce of each town for a brief period.

RELATION OF THE STATE ENTOMOLOGIST'S OFFICE TO OTHER ORGANIZATIONS IN THE STATE.

Activities in the control of insect pests in Montana naturally fall under two headings, namely, scientific or investigational, and practical.

In order that we may know how best to proceed in the practical control of the insects or diseases it is first necessary to know the habits of the insects and to perform experiments with insecticidal substances that give promise of being effective, or to discover the

general character of the diseases and their methods of working. Such investigation involves making prolonged observations, often extending over several years, and requires close application and the use of expensive books and equipment. We believe it is the special province of the State Entomologist to make such investigations of pests and diseases occurring in the State, and that the practical work of controlling them should be left to other organizations, so far as such are appointed by the State for the purpose.

The following divisions include the more important noxious insects which occur or may occur in Montana:

1. Insects affecting growing cereals.
2. Insects affecting legumes and grasses.
3. Insects affecting pasture and range grasses.
4. Insects affecting field root crops.
5. Insects affecting vegetable and garden crops.
6. Insects affecting greenhouse plants.
7. Insects affecting tree fruits.
8. Insects affecting small fruits.
9. Insects affecting stored food supplies.
10. Insects affecting ornamental trees.
11. Insects affecting forest trees.
12. Insects affecting shade trees.
13. Insects of the household.
14. Insects as spreaders of human and animal diseases.

Examples of pests in all of these fourteen classes occur in Montana, and we have repeatedly been called upon to furnish information in regard to each group. Because of the prevalence and importance of insects and diseases affecting fruits, the practical work of controlling these has been turned over by the State to the Board of Horticulture, and we understand that it is the purpose of the State that this board shall have jurisdiction in matters of enforcing the law regarding the importation of nursery stock and fruits, and the inspection of orchards for the presence of diseases which may be eradicated or controlled. No special provision has been made for the insects in the other groups and so the State Entomologist has considered it his duty to gather and distribute the needed information. There will always remain much work for both the State Entomologist and the Board of Horticulture, and it is very desirable that these

two work in hearty cooperation for the general good of the State.

Besides studying the life histories and gathering the necessary information regarding these classes of insects, it is considered the duty of the State Entomologist to experiment with insecticides and acquire information regarding natural agencies which tend to destroy injurious species.

PRICES OF INSECTICIDES IN MONTANA.

During the past two years, while traveling about the State, we have made inquiries at many points regarding the kinds and amounts of insecticides used, and some observations of considerable importance have been made. For many years Paris green has been the standard remedy for the Colorado potato beetle and the country uses annually many thousands of pounds of this insecticide for their destruction. The Gypsy Moth Commission of the State of Massachusetts, in performing its duties in the control of the notorious gypsy moth, found that the Paris green was not effective as a remedy and set about discovering a more suitable arsenical for the purpose. After much experimenting they found that arsenate of lead had marked advantages over Paris green for their work, its three principal advantages being the following:

1. It can be applied in almost any strength without injuring even the most delicate foliage.
2. It adheres to the foliage better than Paris green and is not easily washed off by rainstorms.
3. It is white in color and is easily detected on the foliage of plants.

These advantages have been widely advertised and many firms have begun the manufacture of arsenate of lead. Their products have been sent all over the country and are generally all that is claimed for them, when not adulterated or misbranded, but unfortunately the price, in many instances, has been made such that arsenate of lead is forced to compete with Paris green, pound for pound. In killing power Paris green is from three to four times as strong as arsenate of lead and the wholesale price of the latter is only about a third or fourth as much as that of the former.

In spite of these facts, however, many merchants have been selling lead arsenates at about the same price as Paris green and have

urged their use until, in many instances, growers of potatoes are using them in place of the old remedy. As a result many of them are paying much more for their insecticides than is necessary.

NECESSITY FOR A MONTANA LAW REGARDING ADULTERATED INSECTICIDES.

We have had a number of complaints from different parts of the State, indicating that adulterated or misbranded insecticides and fungicides were on sale, and we wish to call attention to the harm that results from such sale. In the first place, the farmer who buys and uses such inferior goods is defrauded and fails to save his crop. The cost of the insecticides is usually very small compared with the saving resulting from their proper use. In the second place, the farmer who unwittingly uses adulterated goods, too often gains the impression that no benefit results from such spraying, becomes discouraged, and may for years make no further effort to control the same pest.

The federal law regarding adulterated and misbranded insecticides, known as the "Insecticide Act of 1910", takes effect January 1st, 1911, and amply provides for the protection of the country with respect to insecticides and fungicides that enter into interstate commerce. It is highly desirable that a state law be enacted, framed on the same lines as the national law, in order that the State may receive the further protection afforded by preventing the manufacture and distribution of adulterated and misbranded products within its lines. We recommend that such a law be enacted during the coming session of the legislature. At the present time practically no insecticides or fungicides are manufactured in the State except for home use and there would be no opposition to the passage of the law, while there is at least a possibility that manufacturers might move into the State if there were no law preventing such fraudulent practices.

WORK OF THE PAST TWO YEARS.

The activities of the State Entomologist during the past two years are included under the following:—

- (a) Work on the oyster shell scale, including a critical study of

the life history and a review of about thirty-five experimental tests of insecticidal substances.

(b) Work on the wood ticks of the State, especially in the Bitter Root Valley.

(c) Grasshoppers in cultivated crops.

(d) Insect pests of fruits.

(e) Miscellaneous tests of insecticides.

PUBLICATIONS.

It is our plan, in cooperation with the Montana Experiment Station, to issue a series of circulars for the purpose of putting in easily available form the most essential information concerning the leading pests of the State. Two have already been issued, as follows:—

1. The army cutworm.

2. Pear and apple blight in Montana (by Deane B. Swingle).

The following are in course of preparation and will be issued when completed:—

1. Colorado potato beetle.

2. The leading insect pests of the cabbage.

3. Arsenical insecticides.

4. The home preparation of lime-sulphur solutions.

5. The apple leaf aphis.

6. The leading pests of our principal shade trees.

7. Mites affecting fruit trees in Montana.

8. Grasshoppers.

9. Oyster shell scale.

10. Spraying machinery.

11. Control of the bedbug.

12. House flies.

AN INCREASED APPROPRIATION NEEDED.

The State Entomologist now receives an appropriation of \$500, which is used principally as a traveling fund, but which is available also for miscellaneous expenses of the office and laboratory. With the growth of the agricultural interests of the State, principally in the orchard industry, the requests for information have been greatly

multiplied, so that the fund has become entirely inadequate and it is necessary that it be increased.

We have, in the past, been much restricted with respect to the lines of work we could take up on account of a lack of the necessary funds, and have been able to study only a few of the leading problems. It is highly desirable that we be enabled to go to each county, or to each general section of the State, at least once a year, and that we give greater attention to the miscellaneous problems not allowed under the federal funds.

It is also desirable that we give our assistance in the important work of the control of such diseases as pear blight, crown gall, apple scab, cankers, potato diseases, and flax wilt, all of which are receiving practically no attention at our hands, on account of the requirements of the federal funds assigned to us, and because we lack other funds.

It is of great importance that a small amount be available for use in the work on the tick concerned in the transmission of spotted fever, in order that we may continue to receive the benefit of the funds now being expended under the direction of the State Entomologist by the United States Department of Agriculture.

The recent decision of the Supreme Court of the State has had the effect of reducing our traveling fund by about one-half, and it is necessary that other funds be available to meet this added expense.

We have above called attention to the desirability of preparing an extensive exhibit to be taken about the State. This will involve the expenditure of a considerable sum of money in the collection of the materials and in the making of the charts.

We therefore urgently request that the appropriation to the State Entomologist be raised from \$500 to \$1,200 annually, all of this sum to be used as expense money as required by law. None of it is to be available for the salary of the State Entomologist.

December 10 1910.

